

Title: Polygon Mania**Brief Overview:**

This activity invites students to create a polygon gameboard. The task is designed to assess the knowledge of polygons, perimeter, area, and angles by using a variety of materials.

Links to Standards:

- **Mathematics as Problem Solving**

Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.

- **Mathematics as Communication**

Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Mathematics as Reasoning**

Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Mathematical Connections**

Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.

- **Geometry & Spatial Sense**

Students will demonstrate their ability to describe and apply geometric relationships using one, two, and three dimensional objects. They will demonstrate congruency, similarity, symmetry, and reflections and apply these concepts to the solution of geometric problems.

- **Measurement**

Students will demonstrate and apply concepts of measurement using non-standard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem solving situations.

Grade/Level:

Fourth or fifth grade

Duration/Length:

This lesson will take six periods (50 min.):

Prerequisite Knowledge:

- Recognize geometrical names and shapes of polygons
- Determine the perimeter of a polygon using a ruler.
- Determine the area by counting square units
- Work cooperatively in groups

Objectives:

Students will:

- identify attributes of the following polygons: parallelogram, trapezoid, hexagon, and octagon.
- construct the four polygons using pencil, paper, and manipulatives.
- work in cooperative groups.
- state the differences and similarities between the four polygons.
- measure perimeter, area, and angles of a polygon.
- use problem solving strategies to design a geometrical gameboard.

Materials/Resources/Printed Materials:

- chart paper
- magic markers
- pencils
- rulers
- construction paper
- pattern blocks
- masking tape
- crayons
- glue
- dictionary
- encyclopedia
- math texts
- protractor
- geoboard
- overhead projector
- yardsticks

Development/Procedures:

Day 1:

- Introduce the task by reviewing simple polygons and their characteristics.
- Give each cooperative group one of the following four polygons: parallelogram, trapezoid, hexagon, or octagon.
- Instruct each group to work cooperatively to brainstorm the characteristics of their polygon.
- Ask groups to list the attributes of their polygon on chart paper after researching resource materials.
- Allow each group to share their findings with the class.
- Elicit additional feedback and suggestions from peers.
- Have students draw a picture of each of the four polygons in their journal and list the important characteristic of each.
- Using a Venn diagram, class will choose two of the four shapes to compare and contrast. (Teacher Resource Sheet 1)
- Home Extension: Scavenger Hunt (Student Resource Sheet 1).
- Students will find and list the polygons they see on their way home from school and in their home.

Day 2:

- Review home extension and attributes and characteristics of polygons.
- Display pictures of a parallelogram and rectangle to compare and contrast angles and develop concept of right, obtuse, and acute angles (Teacher Resource Sheet 2).
- Discuss four angles seen in a parallelogram.
- Elicit from students that parallelograms have small (acute) angles and large (obtuse) angles.
- Focus on picture of rectangle.
- Ask students what is special about the picture(it has four right angles).
- Discuss and demonstrate using arm motions right angles, obtuse angles, and acute angles.
- Play the game Simon Says, to visually assess understanding of angles.
- Students will complete worksheet to evaluate knowledge of angles (Students Resource Sheet 2).

Home Extension

- Students will find, draw, and label ten items in their home that have right, acute, and obtuse angles.

Day 3:

- Discuss, share, and display Day 2 homework.
- Teacher will demonstrate the proper usage of a protractor.
- Students will be given the opportunity to “fiddle with” the protractor for a couple of minutes to feel comfortable.
- Students will measure right, obtuse, and acute angles.
- Students will measure various angles provided on worksheet. (Student Resource Sheet 3)
- On a overhead projector, teacher will ask for volunteers to share their findings.
- Given a specific measurement, (ex. 120 degrees) students will construct three examples of angles using the protractor.

Home Extension

- Students will construct three angles of their choice to be identified by other classmates.

Day 4:

- Students will discuss last night’s homework.
- Use real-life situations (ex. Sandy designed a bulletin board border.) to help student establish a definition of perimeter.
- Teacher will give guided practice activities using objects in the room, math texts, or overhead projector.
- Students will create their own situation in which they find perimeter through use of geoboards and rubberbands, dot paper, or pattern blocks and share their creativity with classmates.

Home Extension

- Students will find the perimeter of their favorite room and explain their findings in paragraph form.

Day 5:

- Students will volunteer to read their results of finding the perimeter of their favorite room.
- Prior to class, either cut butcher block paper rectangles (8'x3', 4'x6', etc.) or use masking tape to create a variety of large rectangular areas on the floor.
- Give each cooperative group a stack of one-foot paper squares. Instruct them to cover their rectangle with the squares. Determine how many square paper units it took to cover each rectangle.
- Have students measure the length and the width of each rectangle.
- Ask students if they can think of a number sentence we could use to describe the number of square units it took to cover the rectangle ($8 \times 3 = 24$ sq. units etc.).
- Rotate the cooperative groups to each rectangle reinforcing the concept of area and how to determine area using square units, length, and width.
- Students should come up with the definition that area is length x width.
- In classroom, students will complete practice activity of teacher's choice (Student Resource Sheet 4).
- Teacher discusses idea of creating a board game using skills used this week in geometry.

Home Extension

- Students will develop three questions using information learned this week to be used in creating a board game.

Day 6:

- Students will share questions with class that were developed for homework last night.
- Students will divide questions according to the category on the gameboard.
- Students will work cooperatively in groups to design their section of the gameboard.
- Students will be given art materials to create this visually stimulating activity.

Performance Assessment:

You and your classmates will be creating a game called "Polygon Mania" for your class to use and enjoy. Use the following directions below to create your gameboard and the rules to be followed.

Directions:

- Use a piece of 12" x 18" construction paper or tagboard for your gameboard.
- Divide the gameboard into four equal parts. (See Teacher Resource Sheet 3).
- Use your ruler, protractor, and or compass to construct one of each of the following four polygons in each of the parts of the board: parallelogram, trapezoid, hexagon, and octagon.
- Determine four categories of questions for your gameboard (ex. Mystery Polygons, Vocabulary Challenge, etc.).
- Place each category in one of the sections of the board and label.
- Create at least five questions for each of the categories in your game.
- List the rules for your game on a separate piece of paper (to be glued to the back of your gameboard). Add any paths or other features necessary to play your game.
- Play the game to test the rules you created. Be ready to share your game with your classmates.

Criteria for Assessment:

Students will receive one point for each question that fits correctly in their game. 20 points total; 5 points for each category.

Extension/Follow Up:

- Invite other classes to come to a “Geometry Game Day” to play your games.
- Give the games to the media center so children throughout your school could check them out to play at home.

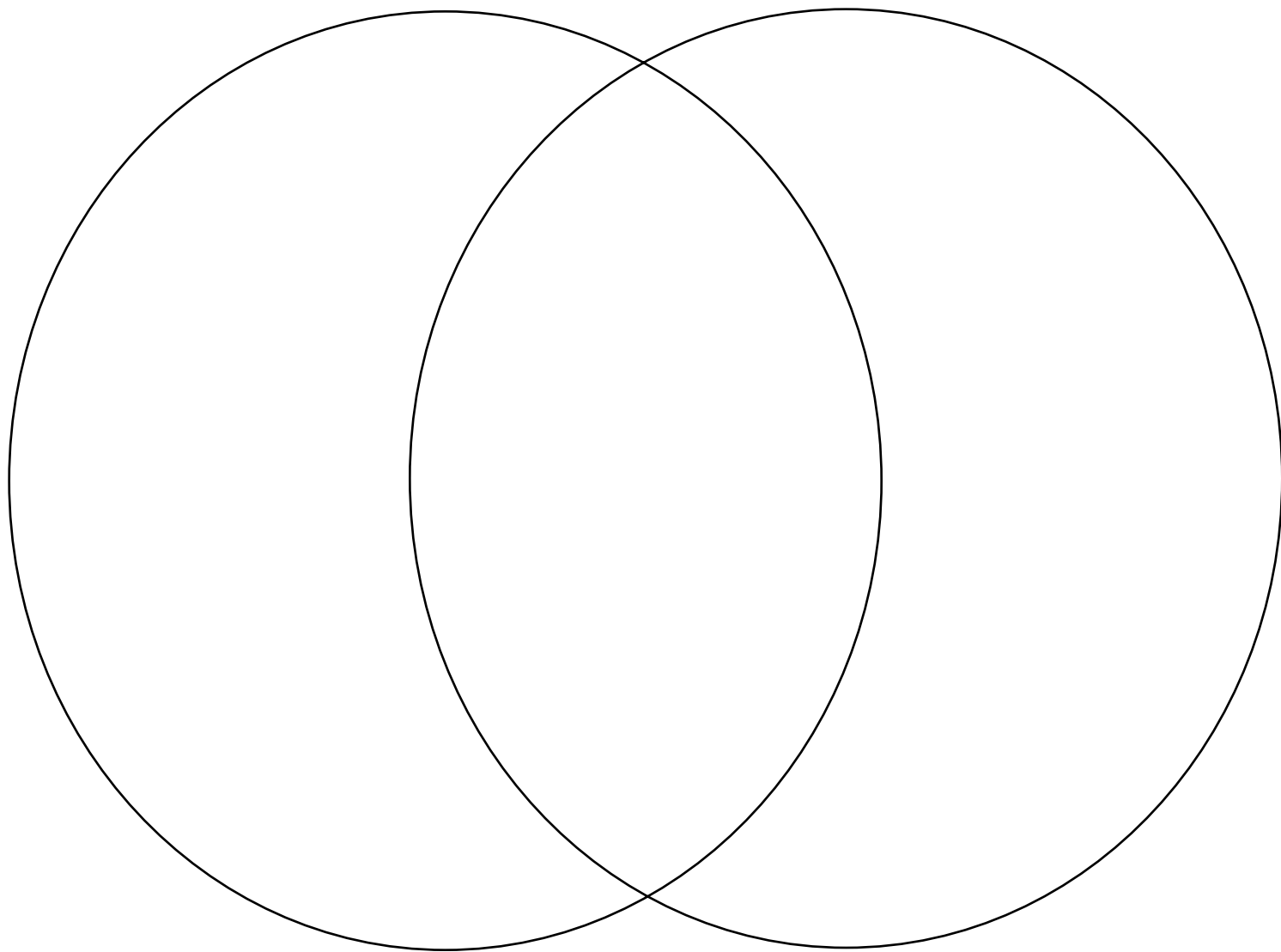
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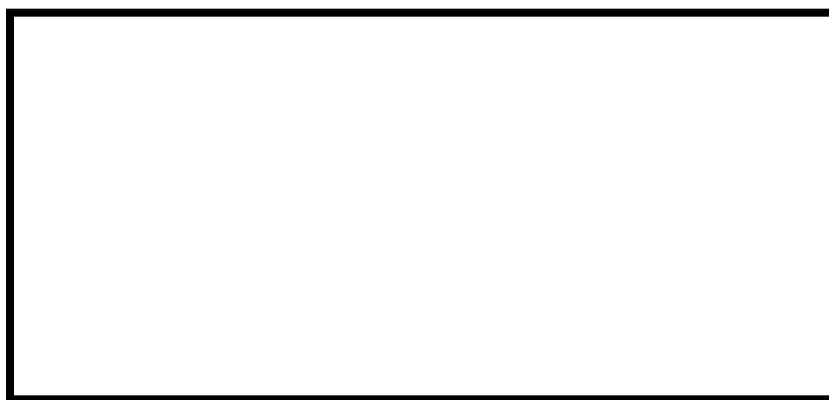
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John Rurah Elementary
Baltimore City, MD

Flora Aisenberg
Windsor Hills Elementary
Baltimore City, MD

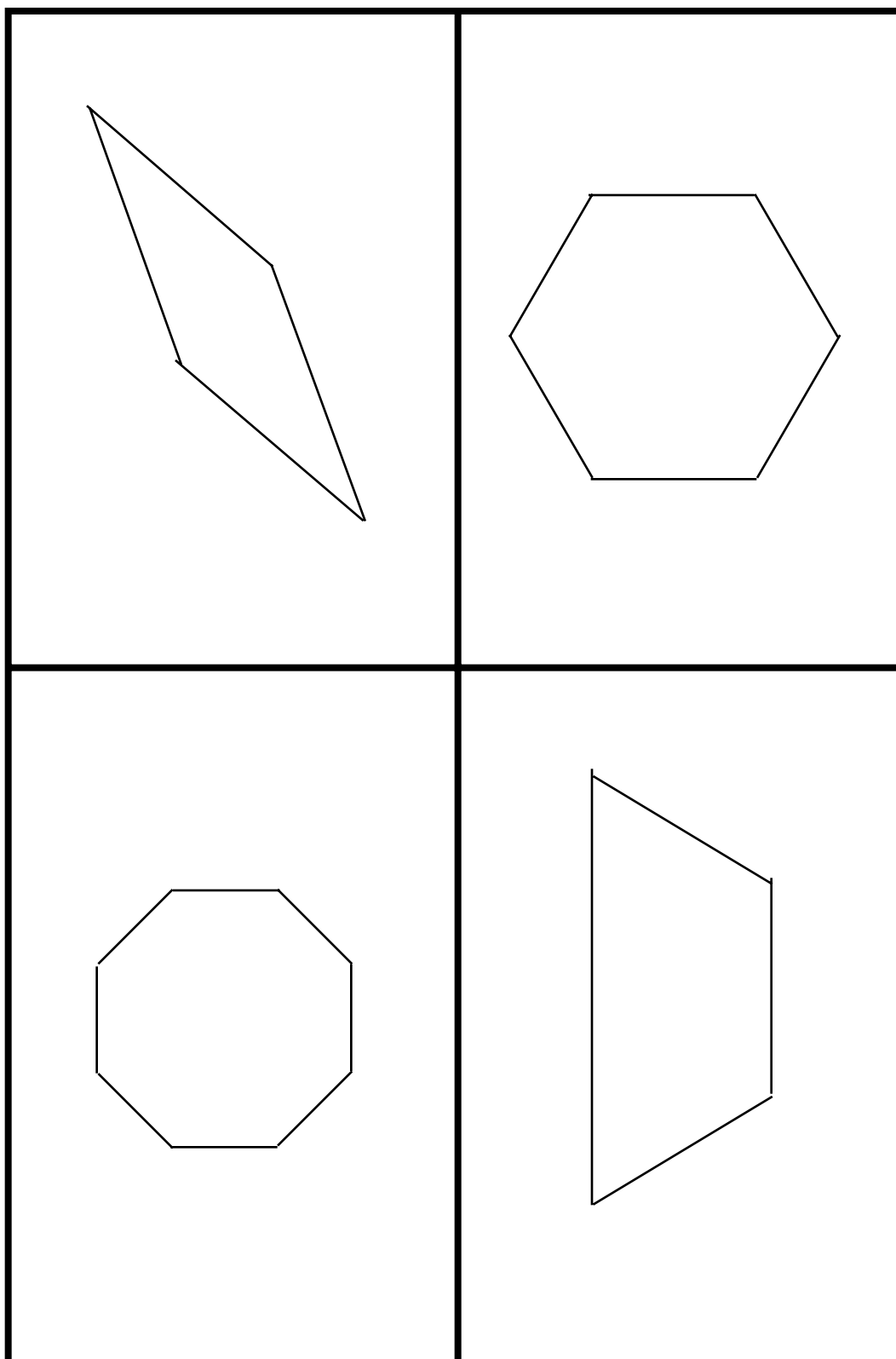
Venn Diagram

Teacher Resource 1





Sample Game Board

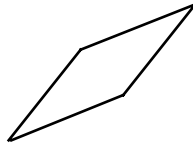


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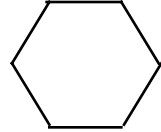
POLYGON SCAVENGER HUNT

Look around your neighborhood and your home. List all the places in which you find the polygons shown below.

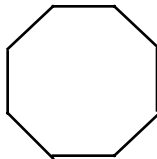
Parallelogram



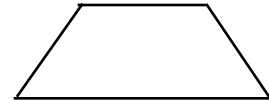
Hexagon



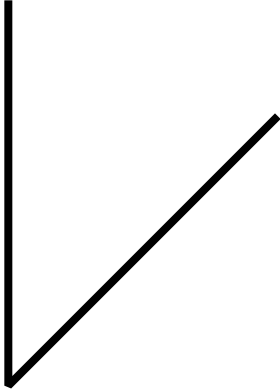
Octagon

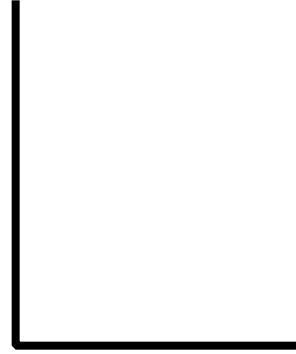


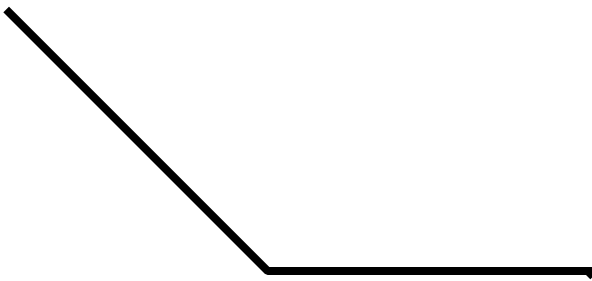
Trapezoid



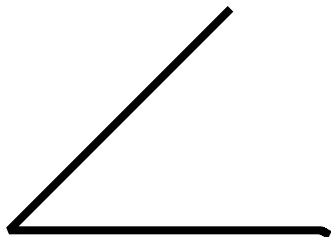
Directions: Label the angles acute, right, and obtuse.





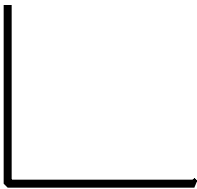








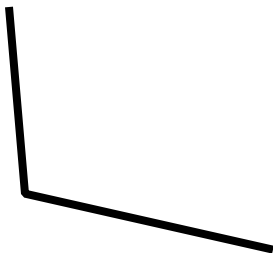
Directions: Measure the angles
given using your protractor in
degrees

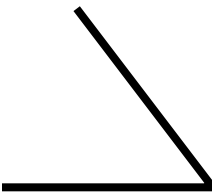




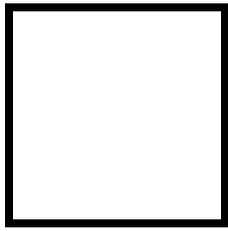








Directions: Find the area of these polygons using cm.





Bonus: Can you figure the area of these two polygons knowing the area of rectangular shapes?

